Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	)	
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	)	
Allocation and Service Rules for the 1675–1680 MHz Band	)	WT Docket No. 19-116
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COMMENTS OF THE
NATIONAL SPECTRUM MANAGEMENT ASSOCIATION

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The National Spectrum Management Association ("NSMA")[1] submits these comments regarding the above captioned Notice of Proposed Rulemaking (NPRM).

SUMMARY

- **Service use recommendation for more successful sharing**
- **Power limits for downlink appear too high to ensure no interference**
- **OOBE limit waiver would increase interference to incumbents**
- **Geographic area bidding is recommended**
- **Federal and non-Federal use cases**
- **Continuity of service and cross-border coordination**

[1] The NSMA is a voluntary association of individuals in the spectrum management profession. Our goal is to promote rational spectrum policy through consensus.

INTRODUCTION

In this NPRM, the Commission proposes rules and solicits comments regarding a proposal to reallocate spectrum in the 1675-1680 MHz band for shared use between incumbent operations and new, non-federal flexible wireless (fixed or mobile) use. The Commission indicates that incumbents will remain in the band, and they are primarily Meteorological Satellite (space-to-Earth) services and Meteorological Aids (e.g. radiosondes). NSMA responds to a subset of the questions presented in the 52-page NPRM.

A. Incumbent Usage of 1675-1680 MHz

As noted in paragraph A, the incumbent users are the Geostationary Operational Environmental Satellites (GOES) Data Collection System (DCS), the GOES ReBroadcast System (GRB), and the High Rate Information Transmission / Emergency Managers Weather Information Network (HRIT/EMWIN).

As referenced by the USGS in https://eddn.usgs.gov/goesdcs.html , GOES DCS is a bent pipe relay of real-time river and stream gauges, coastal sensors, wildfire weather sensors, and gauges on locks and dams. Thousands of terrestrial platforms relay live data via the GOES satellite, to be received at Direct Readout Ground Stations (DRGS) in-band to the spectrum in question.

GRB are live images rebroadcast from the GOES-R series satellites GOES-16 and GOES-17, the follow on to the GOES VARiable (GVAR) downlinks on the GOES-13, -14 and -15 satellites, with GOES-15 supplementing GOES -17 as the western satellite over the US and GOES-14 serving as an in-orbit backup in the event of satellite failure. See http://ospo.noaa.gov

B. Service Use, Power and Out-of-Band Emissions (OOBE)

Uplink Recommendation: Paragraphs 16, 22, 23 and 44 all discuss how the band could be used by a new commercial licensee, or how current federal incumbent earth stations could be protected from harmful interference with an appropriate sharing mechanism that will allow both federal and non-federal (commercial) users to operate successfully in the band.

NSMA recommends that the 1675-1680 MHz band, if it is to be shared, be used for uplink services. The lower power of user equipment, combined with the ability to manage that UE equipment from nearby towers, combined with adequate protection zones for incumbents, would appear to be the best sharing proposal. The FCC followed this same line of thinking when restricting the 1695-1710 MHz band for uplink use only, because it was adjacent to meteorological earth stations in 1675-1695 MHz. Therefore, the answer to the alternate question

in paragraph 23 should be to utilize the band for uplink only , invalidating the comment in paragraph 22 proposing that 1675-1680 MHz be used only as a downlink band.

Power Level: Paragraphs 45 and 46 address the power limit and it specifically seeks information.

NSMA believes that for a proposed downlink service, 2000 watts EIRP would be difficult to guarantee that incumbent services, especially those that are in-band to 1675-1680 MHz would have a very difficult time mitigating the impact of those power levels. First, as in-band to the proposed shared spectrum, filtering would be eliminated as a mitigation. Second, anomalous propagation in this frequency range can exacerbate interference potential from distant sources, when in proximity to water. Many of the incumbent sites are near bodies of water, where impacts from anomalous propagation could be noticeable. Part 27 limits are assumed to be derived considering like systems

The current reference power measurement in peak power should not be changed to an RMS-equivalent. Increasing the transmit power would have a noticeable impact on successful sharing, especially with in-band or directly adjacent incumbents.

Coverage for IoT applications, probably do not require the power levels discussed for conventional LTE applications, addressing the question in paragraph 46.

Out-of Band-Emission Limit Waiver: Paragraph 49 discusses the potential use of 1675-1680 MHz with the adjacent 1670-1675 MHz band. It suggests that a private agreement between users could waive the OOBE limit from 1670-1675 MHz into the 1675-1680 MHz band.

Considering that incumbent earth stations are in-band to 1675-1680 MHz, this would seem to provide an unlimited amount of interference into those in-band incumbent stations. This waiver of OOBE limit does not seem appropriate when the two parties are not the only services in the subject spectrum. NSMA believes this is a bad idea and should not be implemented. The unlimited OOBE would require adjustment to the protection zone sizes for incumbent stations that may make sharing totally impractical, depending upon other service decisions. From a technical point of view, this recommendation should not be included in any final set of rules regarding this band.

C. Licensing Geographic Areas and Bidding Rules

Paragraph 25 request comment on the costs and benefits of adopting a geographic area licensing scheme. Paragraph 26 refers to an *ex parte* that suggested a nationwide license would provide for closer coordination with the adjacent band and asks about licensing on a partial economic area (PEA) basis.

NSMA believes that the Commission should continue to pursue geographic licensing of 1675-1680 MHz, as this would allow opportunities for more bidders (and perhaps small bidders) to

participate in this auction. A nationwide basis would eliminate some bid options and likely reduce the number of bidders, which has not been Commission policy in the past. If the adjacent band is authorized for uplink, downlink or TDD, then offering geographic licensing should not be an impediment to what is already authorized for the adjacent band licensee. NSMA recommends that this band, if sharing is approved, be made available by auction on a geographic basis.

D. Federal vs non-Federal Incumbent Use

Paragraph 19 discusses how "non-federal users operate earth stations that receive the signal from GOES-N and GOES-R series satellites to provide them access to data necessary to carry out their weather forecasting and other activities."

Depending upon which incumbent service is being discussed, will depend upon how relevant it is to break them into Federal versus non-Federal users. NSMA noted this briefing posted to the Internet, regarding the National Weather Service's Hydrometeorological Automated Data System (HADS). According to a publicly posted briefing[2], the Hydrometeorological Automated Data System (HADS) system owns no GOES Data Collection Platforms, but is a processor of more than 17,000 sensor platforms owned by over 200 (federal and non-federal) owners. HADS feeds forecast products of the Advanced Hydrologic Prediction Service (AHPS) discussed in detail at http://water.weather.gov

According to that web page: "The data from water level gauges around the country is gathered by the Hydrometeorological Automated Data System (HADS), operated by the NWS Office of Hydrologic Development. HADS is a data acquisition, data processing, and data distribution system. HADS acquires and processes raw hydrological and meteorological observational data from thousands of ground-based Data Collection Platforms (DCPs) owned and operated by hundreds of federal, state, and local agencies around the United States. HADS delivers the observational data to the Weather Forecast Offices (WFOs) and River Forecast Centers (RFCs) in the form of collective data products tailored for each office's use. The WFOs and RFCs subsequently use the data in their hydrologic models …"

NSMA has no particular expertise in how this data is used, but we see the web page continues[3]: "AHPS forecast products are a basis for operation and management of flood-control structures. Emergency management officials at local and state levels use these forecasts to fight floods,

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[2] https://acwi.gov/hydrology/stiwg/Meetings/20190425/secondary_processors_goes_dcs_data_nws_042519.pdf

[3] https://water.weather.gov/ahps/about/about.php

evacuate residents, and to take other measures to mitigate the impact of flooding. … These products can be used by a wide range of people, such as barge operators, power companies, recreational users, farmers, households, businesses and environmentalists."

The point being – equipment owned by federal and non-federal agencies, and therefore received by both federal and non-federal earth stations - is collectively used as the source for weather forecasts for these water products. If the National Weather Service depends upon all of them, and owns none of them, and the non-federal user has no earth station protection then why would they continue to fund and supply that data for federal use?

It does not appear that the GOES-DCS really can be segmented into two different user types, as all of the data is important for federal use.

For the GOES-ReBroadcast, NSMA would hope the weather community can explain how the federal receive sites listed in paragraph 8 and footnote 34 interact with non-federal earth station receive systems. Upon examination of federal websites[4] discussing GOES DCS and the USGS, NSMA notes that the Sioux Falls, SD site, operated by USGS, is missing in paragraph 8.

Paragraph 20 states "we seek comment on how non-Federal MetSat receivers use MetSat data and the products or services each data supports."

Although most NSMA members are not users of "MetSat receivers" we do note several sites on the Internet that discuss how GOES DCS data is used. Since, as mentioned previously in this filing, the National Weather Service does not own any water gauges, and the owners of the gauges they use (about 200 entities) consist of federal and non-federal users, it is logical to assume that if a private sensor user can no longer obtain the data from a station that they operate, they would no longer maintain the sensor for use by NWS. With that in mind we refer to several usage stories for flooding or wildfire that we have identified on the Internet in the course of preparing this filing:

- Mississippi River flooding near St Louis, second only to the Great Flood of 1993. USA Today, May 28, 2019[5]
    - "Over the next week, the Mississippi River is projected to soar to a crest of 44 feet downtown [St Louis] – 14 feet above flood stage – according to Monday evening forecasts based on U.S. Geological Survey data." The article provided a

[4] https://eddn.usgs.gov/goesdcs.html

[5] https://www.stltoday.com/news/local/govt-and-politics/st-louis-area-flood-forecasts-pushed-higher-second-only-to/article_986d93a5-6a15-5bb4-b984-2ea523ac8951.html

map and chart of St. Louis-area river gauges and a table of statistics. Their source was the NOAA Advanced Hydrologic Prediction Service, which uses HADS as a source of gauge data.

"Use of water gauge data via GOES DCS in Hurricane Harvey. The weather service reported: Back in 2017, Hurricane Harvey caused historical rainfall and catastrophic flooding across SE TX. During this time, 33 of our 67 river forecast points reached record flooding. If it weren't for the GOES DCP data, we would not have had the information we needed to provide accurate and timely river forecasts, updates, and warnings that ultimately saved thousands of lives and allowed for people to protect their property. We did not have any issues during the event with regards to the GOES transmission. In comparison, our office also uses gauge data from an external partner that is not ingested via GOES DCPs; however, during Harvey, there was a hiccup with their system, which resulted in the loss of critical data during the peak of the heavy rainfall event. In addition to the seamless data flow from GOES, we were also able to ingest data from rapid deployment gauges that were quickly installed prior to landfall in high impact areas that did not have permanent gauging. This information was vital to collecting observations for future use. Without GOES data, we would not be able to fulfill our mission of saving lives and property. "

Since much of the initial (Harvey) flooding data comes from Harris County, Texas, (encompassing Houston) we searched for any reports regarding flood measurements, Internet reports or after-action reports on Hurricane Harvey. We found two reports[6] by the Harris County Flood Control District (HCFCD) and Harris County "Hurricane Harvey: Impact and Response in Harris County" and "Hurricane Harvey: Read the final flood report." We noticed that the HCFCD indicated they operated the county's 154 rainfall gauges. We also noted that they used data from about 5 federal gauges operated by USGS, and that seven of those non-federal gauges were damaged or destroyed by flood waters that overcame the gauge structure and electronics. The second report indicated that 375,000 rainfall and stage data points (from gauges) arrived into the county flood warning system and that their website experienced over 4.6 million page-views during [Hurricane] Harvey.

- In 2018 the Bureau of Land Management (BLM) (obviously a federal user) covered 52 fire incidents with the Incident Remote Automatic Weather Stations (IRAWS), using 117 IRAWS. A number of these federal uplink stations were deployed on wildfires in California (approximately 23). The California Department of Forestry, a non-federal user also deployed IRAWS stations for use via GOES-DCS. The total of these uplink stations in the State of California are 533, which may imply a large percentage being non-Federal. Both the federal and non-federal incumbent users would be supported by receive stations.

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[6] https://www.hcfcd.org/media/3108/harvey-impact-and-response-book-final.pdf

https://www.hcfcd.org/media/2678/immediate-flood-report-final-hurricane-harvey-2017.pdf

- Eastern North Carolina has seen flood events, covered by the national news from Hurricanes Matthew (2016), Irene (2011), and Floyd (1999). During the storm associated with Hurricane Florence, numerous flash flooding events and road washouts occurred. Real time rainfall and river gage readings were critical to warning services during this historic event. Coordination between agencies prior to, and during the storm, allowed use of rapid deployment gages to supplement the normal observing network, as many gages were overtopped by flood waters. (It is possible but unclear to NSMA if the rapid deployment gages were non-federal or federal-owned and received.) Interesting technical side issue where GOES DCS contributes: Real time (hourly or less reporting frequency) rain gages are essential for the calibration of the Doppler Radar rainfall estimates. Dual Polarization radar algorithms were "off the charts" in this event, making radar rainfall estimates suspect. Without valid automated gage reports via GOES-DCS, forecasters would have had more difficulty identifying flash flood trigger points. This was reported per web pages listed in the footnotes.
- Texas Water Development Board[7] uses GOES-DCS monitors real time groundwater level data. Groundwater conservation districts are statutorily required to develop and implement plans to attain desired future conditions for their aquifers, and monitors surface and groundwater quality data, and stream and lake gauging data, needed for accurate flood warning systems, drought monitoring, and long-range assessment of surface water availabilities.
- The Red River Basin Commission[8] receives data from over 200 gages in Minnesota to provide flood warning and critical flood predictive information to NWS and to States of North Dakota, Minnesota, and South Dakota. This network of state and federal stream and precipitation gages provides critical real time data. Non-federal cost sharing partners include North Dakota State Water Commission, Minnesota Department of Natural Resources, SE Cass Water Resource District, Cass County Joint Water Resource District, Red River Joint Water Resource District, North Dakota Department of Transportation, the city of Grand Forks, Ottertail Power, Minnesota Red River Water Management Board, the Buffalo/Red Watershed District and the Red Lake River Watershed District.

[7] https://ecfsapi.fcc.gov/file/7021858299.pdf

[8] https://ecfsapi.fcc.gov/file/7020701545.pdf

Red River Basin Commission Coverage in US and Canada

- Minnesota Department of Natural Resources[9] has 75 real time stream gages using GOES DCS. In addition, MDNR (a non-federal user) provides funding to USGS to maintain a network of over 100 federal gages in Minnesota. This network of state and federal stream and precipitation gages provides critical time sensitive data for flood warning and flood control efforts in Minnesota and border states.
- South Florida Water Management District[10], operates and maintains a complex network of water control structures to manage and protect the water resources of the region by balancing flood control, water supply, water quality and environmental needs. This district serves 16 counties, covering a region from Orlando to Key West. The district directly accesses the data transmission from 310 USGS sites, with a dedicated GOES DCS satellite receive station, every 4 hours at their headquarters in West Palm Beach, FL.
- Lower Colorado River Authority[11] receives data at their earth station acquiring data logged every 15 minutes. LCRA is a nonprofit conservation and reclamation district created by the Texas Legislature in 1934. They provide electricity, water, flood management, water and wastewater utilities, public parks, and community and economic development for rural and suburban communities. LCRA operates six dams on the Colorado River that form the scenic Highland Lakes: Buchanan, Inks, LBJ, Marble Falls, Travis and Lake Austin. The equipment is primarily used to collect field data to support

[9] https://ecfsapi.fcc.gov/file/7020549571.pdf

[10] https://ecfsapi.fcc.gov/file/7020513971.pdf

[11] https://ecfsapi.fcc.gov/file/7020513980.pdf

both weather and flood forecasting which supports federal and non-federal weather and flood forecasting. All collected data is directly used by the NWS in calibration of rain gauge adjusted rainfall estimates, and routinely applied to weather and flood forecasts. LCRA makes informed operational decisions for the Lake Travis water supply and flood control reservoir and uses GOES-DCS received data to operate five other reservoirs on the main stem of the Lower Colorado River, to aid public safety during flood events, and to improve efficiency in water supply management. Data from LCRA sensors are provided to local emergency management agencies, universities and the news media to support weather forecasting and data dissemination, flood forecasting and water supply management.

- Florida Department of Transportation[12] operates redundant GOES-DCS earth stations that assists emergency management and law enforcement personnel in determining when to close road bridges due to high wind during severe weather (hurricanes). Bridge mounted wind speed monitors, in real time, monitor conditions and are used to help predict when unsafe driving conditions are occurring on bridges.
- Miami (Ohio) Conservancy District[13] built and maintains a flood protection system consisting of five dams, 55 miles of levees, and 35 miles of stream channel in the Great Miami River Watershed in southwestern Ohio. The total value of property protected by the MCD flood protection system is estimated at 3.5 billion dollars. Timely data from 22 stream gaging station are used for which we purchased. It is operated and maintained through a cooperative agreement between MCD and USGS. Hydrologic data is fed by the GOES DCS system to the Advanced Hydrologic Prediction Service at NOAA for timely forecasts of river stage peaks. MCD uses these forecasts to anticipate floodgate closures and other operational tasks during a high-water event. Local emergency responders use this data during flood events to determine when local road closures and evacuations may be necessary for flooding in areas not protected by our levees and flood protection system. Water and wastewater utilities access the data for daily operational use. Private engineering firms use the data for construction projects and environmental projects. MCD used GOES DCS data to move through the FEMA levee accreditation process to show that MCD levees meet FEMA criteria for accreditation. Boaters and anglers access GOES data from our gages on a regular basis to determine boating and fishing conditions.
- University of Colorado, Cooperative Institute for Research in the Atmosphere: provides display for all GOES-R imagery received by a receive-only GRB system to make extremely high-resolution satellite imagery loops easily accessible online to a diverse set of users. The Satellite Loop Interactive Data Explorer in Real-Time (SLIDER) may be seen at http://rammb-slider.cira.colostate.edu/

[12] https://ecfsapi.fcc.gov/file/7020513863.pdf

[13] https://ecfsapi.fcc.gov/file/7020513513.pdf

The web page is used by a wide variety of purposes by users such as the science and operations officers working at NWS forecast offices, Incident Meteorologists supporting wildfire operations, airline dispatchers, press outlets, and the general public[14].

This appears to be one of many such non-federal sites (College of DePage, University of Wisconsin-Madison) that make this information broadly available, such that the question in paragraph 20, how could this data be made available more broadly, seems to be irrelevant.

NSMA has found further examples of such usage documented on the Internet, but believe many major users that we found such as The Weather Company and AccuWeather would be likely to comment in this proceeding. We will leave those experts to input non-federal use for their own needs.

E. Continuity of Service and Cross Border Coordination

Continuity of Service: Paragraph 20 seeks comment on alternative means of delivering such data to current users and other interested parties.

For example, could an Internet-based or private network content delivery service be used to make the GOES data available more broadly? NSMA notes that the GOES-R GRB downlink requires an availability of 99.998%, which is much higher than that of a typical cloud delivery network, and certainly more than internet connectivity. Since GOES-DCS is a dedicated bent pipe relay system, we do not see that a CDN would have any utility collecting the gage data, so our comments will focus upon the GOES rebroadcast.

We also do not understand how a privately owned receive station could guarantee reception without interference, as they would not likely be protected under the proposed rules of this NPRM, nor under Commission rules. There is no guarantee that radio frequency interference would not occur, even if the CDN operator managed a license in 1675-1680 MHz.

Availability, with percentages referring to uptime, can often be better understood when stated as downtime.

Availability	Downtime over a 30-Day Period
90% (1-nine)	72 hours
99% (2-nines)	7 hours 12 minutes

[14] https://journals.ametsoc.org/doi/full/10.1175/BAMS-D-17-0272.1

99.9% (3-nines)	43 minute 12 second
99.99% (4-nines)	4 minute 19 seconds
99.999% (5-nines)	26 seconds
99.9999% (6-nines)	3 seconds

We note per http://hostingmanual.net that "Some web hosts offer real uptime guarantees. Others just say they have at 99.9% uptime guarantee, but if one reads the terms of service (that they make you agree with), most of the times you will notice that they do not guarantee it for real. If they don't deliver the uptime they promised, nothing happens."

NSMA notes that in a previous filing in proceeding RM-11681, availability was discussed.[15]

That document indicates that the "GRB services has an availability of 99.988% over a 30-day period". It goes on to state, " This availability ensures no more than five minutes of downtime in a one-month window, essentially the time it takes to capture one image of the contiguous United States and ten mesoscale sectors." We presume that each image of the weather satellite may be important and hope that commenters who understand the weather satellite data might further confirm this. If this is true, the actual availability guaranteed by the terms of service needs to be higher than 4-nines and less than 5-nines.

Canada-Mexico Cross Border: Paragraph 52 discusses Canada and Mexico coordination.

NSMA notes that a Canadian Government filing[16] describes GOES DCS and GRB stations, some in proximity of the US Canadian border, which would seem to trigger such cross-border coordination.

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15 https://ecfsapi.fcc.gov/file/104132285323927/FCC_AMS_AGU_SSEC_Feedback_April_2017.pdf

16 https://ecfsapi.fcc.gov/file/105013031405442/MSC%20Response%20to%20FCC%20NPRM%20WT19-116.pdf

CONCLUSION

In principle we support the Commissions goal to share spectrum while protecting incumbent services. We believe that these revisions discussed by NSMA to the proposed rules would further support those goals. However, when incumbent services support safety of life and property, and have widespread public benefit, we will examine the technical considerations and recommend any changes we believe are needed.

We look forward to working with the Commission in this new world of disparate services frequency management. Indeed, we live in interesting times.

Respectfully submitted,

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